

## **STORAGE UNIT WITH ROLLING TRAY ARRANGEMENT FOR HEAVY LOADS**

### **CROSS-REFERENCE TO RELATED APPLICATION**

[0001] The present application claims priority under 35 U.S.C. §120 to Provisional Application No. 60/406,792 filed August 29, 2002, the entire contents of which are hereby incorporated by reference.

### **BACKGROUND OF THE INVENTION**

#### **Field of the Invention**

[0002] The present invention relates to a storage unit with a rolling tray arrangement for heavy loads.

#### **Description of Background Art**

[0003] Batteries are commonly used to provide back-up power for telecommunication and other electrical equipment, and in many applications these batteries are installed in drawers that slide out to facilitate installation and maintenance. Currently, most of these applications use conventional full-extension (Three (3) member), or  $\frac{1}{2}$  to  $\frac{3}{4}$  extension (Two (2) member) ball-bearing slides. Figures 1 and 2 show a typical cabinet 1 that houses electronic equipment in the upper compartment 1a and batteries B in the battery compartment 1b below. (The doors or panels that cover these compartments are not shown in these figures for clarity.) While this drawer configuration is effective, large-capacity conventional slides 3, particularly corrosion resistant versions, are expensive. In addition, the drawer assembly 2 and any

additional reinforcement required to provide earthquake resistance can increase costs significantly.

### **SUMMARY AND OBJECTS OF THE INVENTION**

[0004] It is the object of the present invention to provide a storage unit with an improved tray arrangement which provides adequate access to the batteries and other electrical equipment and has sufficient corrosion resistance and strength for earthquake resistance, while being cost effective.

[0005] The present invention provides four configurations to satisfy the above objectives: a *Roller Shelf Configuration*, a *Cantilevered Roller Tray Configuration*, a *Detachable Roller Track Configuration*, and a *Hybrid Slide/Roller Configuration*.

[0006] The storage unit with the Roller Shelf Configuration of the present invention provides a storage compartment with sides; an opening in at least one of the sides; a lower portion of the storage unit provided with a plurality of rollers; and a roller shelf provided with a plurality of rollers capable of being attached to the storage unit so that the roller shelf extends away from an edge of the opening of the storage compartment, such that one or more trays for carrying items to be stored in the storage compartment, may be moved over the rollers of the storage unit, out through the opening, and onto the rollers of roller shelf.

[0007] The storage unit with the Cantilevered Roller Tray configuration of the present invention provides a storage compartment with sides; an opening in at least one of the sides; a plurality of rollers arranged on a lower portion of the storage unit; a tray for

carrying items to be stored in the storage compartment, the tray being movable over the rollers out through the opening so that substantially  $\frac{3}{4}$  of the tray may extend outside of the storage compartment, wherein hold-down brackets hold the tray in a cantilevered position when the tray extends outside of the storage compartment

[0008] The storage unit with the Detachable Roller Track Configuration of the present invention provides a storage compartment with sides; an opening in at least one of the sides; a movable tray for carrying items to be stored in the storage unit, the tray being supported on rollers fixed to sides of the tray, the rollers capable of rolling in two fixed roller tracks mounted on two sides of the storage compartment; a detachable roller track extension extending from each of the fixed roller tracks, the roller track extensions extending out through the opening; the tray being rollable over the fixed roller tracks of the storage unit, out through the opening and onto the roller track extensions.

[0009] The storage unit with the Hybrid Slide/Roller Track Configuration provides supplementary rollers that are mounted on a lower portion of the storage unit having conventional slides.

[0010] In any of the above configurations, the roller components (typically plastic rollers, stainless steel shoulder bolts or pins, and sheet metal brackets) are considerably less expensive than corrosion resistant heavy-duty full extension slides.

[0011] Each of the above described configurations provide a tray arrangement which improves access to the batteries or other equipment stored on the tray, and provides

sufficient corrosion resistance and strength for earthquake resistance, while being cost effective.

[0012] Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0013] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention, and wherein:

[0014] FIG. 1 shows a cabinet with a tray in a closed position, in accordance with the background art;

[0015] FIG. 2 shows the cabinet of FIG. 1 with the tray in an open position;

[0016] FIG. 3 shows a first embodiment of the present invention, a roller shelf configuration with a tray in a closed position;

[0017] FIG. 4(a) shows the first embodiment of the present invention, with the roller shelf attached to the cabinet and the tray in the closed position;

[0018] FIG. 4(b) shows the first embodiment of the present invention, similar to FIG. 4(a) with the roller shelf including two or more bracket assemblies;

[0019] FIG. 5 shows the first embodiment of the present invention, the roller shelf configuration with the tray in an open position;

[0020] FIG. 6 shows a cross sectional view of the first embodiment of the present invention, the roller shelf prior to being attached to the cabinet, and the tray in the closed position;

[0021] FIG. 7 shows a cross sectional view of the first embodiment of the present invention, the roller shelf attached to the cabinet, and the tray in a closed position;

[0022] FIG. 8 shows a cross sectional view of the first embodiment of the present invention, the roller shelf attached to the cabinet, and the tray in the open position;

[0023] FIG. 9 shows the first embodiment of the present invention, the tray in the closed position, and the roller shelf stowed in the cabinet;

[0024] FIG. 10 shows the first embodiment of the present invention, the tray in the closed position, with an integrated roller shelf/door panel;

[0025] FIG. 11 shows the first embodiment of the present invention, the roller shelf configured for bi-directional travel;

[0026] FIG. 12 shows a second embodiment of the present invention, a cantilevered roller tray configuration with the tray in a closed position;

[0027] FIG. 13 shows the second embodiment of the present invention, the cantilevered roller tray configuration with the tray in an open position;

[0028] FIG. 14 shows a cross sectional view of the second embodiment of the present invention, the cantilevered roller tray configuration with the tray in the closed position;

[0029] FIG. 15 shows a cross sectional view of the second embodiment of the present invention, the cantilevered roller tray configuration with the tray in an open position;

[0030] FIG. 16 shows a front view of the second embodiment of the present invention, the cantilevered roller tray configuration with the tray in a closed position;

[0031] FIG. 17 shows the second embodiment of the present invention, the cantilevered roller tray configuration configured for bi-directional travel;

[0032] FIG. 18 shows a third embodiment of the present invention, prior to attaching a detachable roller track extensions to the cabinet;

[0033] FIG. 19 shows the third embodiment of the present invention, after attaching the detachable roller track extensions to the cabinet, with the tray in a closed position;

[0034] FIG. 20 shows the third embodiment of the present invention, after attaching the detachable roller track extensions to the cabinet, with the tray in an open position;

[0035] FIG. 21 shows a cross sectional view of the third embodiment of the present invention, prior to attaching the detachable roller track extensions to the cabinet;

[0036] FIG. 22 shows a cross sectional view of the third embodiment of the present invention, after attaching the detachable roller track extensions to the cabinet, with the tray in the closed position;

[0037] FIG. 23 shows a cross section view of the third embodiment of the present invention, after attaching the detachable roller track extensions to the cabinet, with the tray in the open position;

[0038] FIG. 24 shows legs attached to free standing roller track extensions of the third embodiment;

[0039] FIG. 25 show the legs of the roller track extensions being attached to each other; and

[0040] FIG. 26 shows a fourth embodiment with supplementary roller mounted under a drawer that uses conventional slides.

### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0041] Next, several embodiments of the present invention will be described.

#### **1. Roller Shelf Configuration (First Embodiment)**

[0042] The Roller Shelf Configuration is depicted in FIGS. 3 through 8. This embodiment the storage unit is a cabinet 1 and uses a tray 4 to hold the batteries B. Tray 4 sits on rollers 5, which are mounted to the inner bottom surface 1c of the cabinet 1 beneath the tray 4. Side walls 6a of a roller shelf assembly 6 are provided with hooks 6b for attaching to shoulders 9a of the cabinet opening 9. To remove the batteries B, the roller shelf assembly 6 is first attached to the cabinet 1, and then the tray 4 is rolled out. The roller shelf 6 can be designed to allow the tray 4 to slide out to nearly any desired distance, even beyond full extension. An important feature of this configuration is that one roller shelf 6 can be used for multiple trays 4 in multiple cabinets 1.

[0043] In some cases, use of rollers 5 below the tray 4 reduces the usable height available for batteries, and might increase the cabinet height as compared to using

slides mounted on the side of the drawer. However, the configuration of the first embodiment uses a cabinet design allowing the rollers 5 to be placed between structural components or behind flanges 7 that are required to seal or secure a door 10 or panel. In these cases, rollers 5 are below the inner bottom surface 1c of the cabinet 1 and do not result in a height penalty.

**[0044]** The following enhancements may be applied to the storage unit with the Roller Shelf Configuration embodiment:

- The roller shelf 6 may be flipped over and stored above the batteries B as shown in FIG. 9. In this arrangement, the shelf 6 can be stored very compactly in the storage unit. In addition, the roller shelf 6 in this stowed position can hold down the batteries B in earthquake prone areas.
- The roller shelf 6 may be free standing or attached to the cabinet 1 on one side of the roller shelf 6 and supported with legs 6d on the other end of the roller shelf 6. See Fig. 11.
- The roller shelf 6 may be part of the door 10 of the battery compartment 1b, so that when the door is opened, it hinges down on pivot shaft 11 into the working position. See FIG. 10.
- The roller shelf 6 can be replaced with two or more separate bracket assemblies 6c1, 6c2 that have rollers 5. As compared with the roller shelf 6 shown in FIG. 4(a), the two bracket assemblies 6c1, 6c2 shown FIG 4(b) are mounted at the opening of the storage unit. The bracket assemblies 6c1, 6c2 may be used together,



in a manner similar to a single roller shelf, or separately, depending on the configuration of the trays 4 in the storage unit.

- The roller shelf configuration may include an interlock 8 to prevent the tray 4 from sliding prior to attaching the shelf 6. See FIG. 6.
- When used in a storage unit with openings on two sides, the roller shelf configuration can allow bi-directional travel of the tray 4. See FIG. 11.
- The storage unit with the Roller Shelf Configuration may have a variety of configurations, such as the cabinet 1, shown in the figures, or alternatively may be a rack having a frame with open sides, as typically used to house electrical, computer, and telecommunications equipment, cabling, and the like.

**[0045]** The storage unit with the Roller Shelf Configuration has numerous advantages over drawer designs of the background art, including:

- **Reduced Cost:** The roller components 5 (typically plastic rollers, stainless steel shoulder bolts or pins, and sheet metal brackets) are considerably less expensive than corrosion resistant heavy-duty full extension slides. In addition, since the battery weight is distributed over multiple rollers 5, the tray 4 requires minimal strength, even for a large size, a large weight capacity, and when designed to be earthquake resistant. In the minimum configuration, the tray 4 is simply a flat plate without any sides 4a. This means the tray 4 is less expensive than the comparable drawer 2 that is typically used with conventional slides 3, which requires reinforcement to transfer the load to the sides of the drawer 2 and to prevent

excessive sagging. Additional cost savings are achieved if the roller shelf 6 is shared with many trays 4 and multiple storage units.

- **Longer Travel:** The Roller Shelf Configuration can allow the tray 4 to slide out well beyond full extension with little additional cost. Three (3) member slides can go only slightly beyond full extension. Additional travel in a cabinet 1 with conventional drawers 2 would require considerably more expensive slides with four (4) or more members.
- **Reduced Width:** The Roller Shelf Configuration requires less width. (No space is required for slides.)
- **Reduced Height:** The Roller Shelf Configuration requires less height in some configurations. This occurs when the rollers 5 can be recessed into the cabinet 1 so that the entire battery compartment opening 9 can be used by the tray 4 and batteries B. Since there is no need for additional reinforcement at the bottom of the tray 4, the overall height of the battery compartment 1b can be reduced as compared to a drawer 2 in accordance with the background art.

## **2. Cantilevered Roller Tray Configuration (Second Embodiment):**

[0046] The storage unit with the Cantilevered Roller Tray Configuration is depicted in Figures 12 through 16. Like the Roller Shelf Configuration, this embodiment uses a tray 4 that holds batteries B that sits on rollers 5. The rollers 5 are mounted to projections 14 which run in one or more rows (four rows are shown in FIG. 14) on an inside bottom surface 1c of the cabinet 1 beneath the tray 4. In this second

embodiment a roller shelf 6 is not used. Instead, the tray 4 has hold-down bracket(s) 13 that allow the tray 4 to roll out of the cabinet 1 to approximately  $\frac{3}{4}$  the depth of the tray 4. The hold down brackets 13 prevent the rear of the cantilevered tray 4 from lifting up and may also limit the tray's travel. The hold-down brackets are angle-shaped members, for example L-shaped, S-shaped or Z-shaped members and project under at least some of the rollers arranged along the lower portion of the storage unit. This configuration is an economical substitute for two (2) member slides 3.

[0047] The following enhancements may be applied to the storage unit with the Cantilevered Roller Tray Configuration embodiment:

- Rollers 5 may be part of the door 10 of the battery compartment 1b so that when it is hinged down (opened) it provides additional support for the roller tray 4 allowing greater travel. See FIG. 15.
- The cantilevered roller tray configuration can allow travel in two directions. This is shown in Figure 17.
- As with the Roller Shelf Configuration, the storage unit with the Cantilevered Roller Tray Configuration may have a variety of forms, such as the cabinet 1, shown in the figures, or alternatively the storage unit may be a rack having a frame with open sides, as typically used to house electrical, computer, and telecommunications equipment, cables, and the like.

[0048] The storage unit with the Cantilevered Roller Tray Configuration has the following advantages over drawer designs of the background art:

- **Reduced Cost:** The roller components 5 (typically plastic rollers, stainless steel shoulder bolts or pins, and sheet metal brackets) are less expensive than corrosion resistant heavy-duty  $\frac{1}{2}$  and  $\frac{3}{4}$  extension slides 3. In addition, since the battery weight is distributed over multiple rollers 5, the tray 4 requires less strength, even for a large size, a large weight capacity, and when designed to be earthquake resistant. This means the tray 4 is less expensive than the comparable drawer that is typically used with conventional slides, which requires reinforcement to transfer the load to the sides of the drawer and to prevent excessive sagging.
- **Reduced Width:** The Cantilevered Roller Tray Configuration requires less width. (With the present invention, no space is required for slides.)
- **Reduced Height:** The Cantilevered Roller Tray Configuration requires less height in some configurations. This occurs when the rollers 5 are recessed into the cabinet 1, so the entire battery compartment opening 9 can be used by the tray 4 and batteries B. Since there is no need for additional reinforcement at the bottom of the tray 4, the overall height of the battery compartment 1b can be reduced as compared to a drawer 2 in accordance with the background art.

### **3. Detachable Roller Track Configuration (Third Embodiment):**

[0049] The storage unit with the Detachable Roller Track Configuration is depicted in Figures 18 through 25. This embodiment uses a tray (drawer) 4 that has rollers 5 mounted on two sides 4a. These rollers 5 ride in tracks 15 that are attached to the inner sidewalls of the cabinet 1. To remove the batteries B, detachable track extensions 20

are first attached to tracks 15 within the cabinet 1, and then the tray (drawer) is rolled out. The track extensions 20 can be designed to allow the tray (drawer) 4 to slide out to nearly any practical distance, even beyond full extension. An important feature of this configuration is that the roller track extensions 20 can be used for multiple trays 4 in multiple cabinets 1.

[0050] The following enhancements may be applied to the storage unit with the Detachable Roller Track Configuration embodiment:

- The track extensions 20 may be free standing or attached to the cabinet 1 on one side and supported with legs 20a on the other. See FIG. 24.
- The track extensions 20 may be attached to each other to facilitate manufacture and/or installation. See FIG. 25.
- The track extensions 20 may incorporate an interlock 30 that prevents the tray (drawer) 4 from sliding prior to attaching the track extensions 20. See FIG. 22.
- The tray (drawer) 4 may be supported by supplementary rollers 5 that are mounted beneath the tray (drawer) 4 to support the load in the closed position. This additional support may be particularly useful in increasing the load bearing capacity of the tray (drawer) 4 in earthquake prone areas. These rollers 5 may also reduce sag of the tray which may reduce the height required in the cabinet 1.
- As with the configuration described above, the storage unit with the Detachable Roller Track Configuration may have a variety of forms, such as the cabinet 1, shown in the figures, or alternatively the storage unit may be a rack having a frame

with open sides, as typically used to house electrical, computer, and telecommunications equipment and cables.

[0051] The storage unit with the Detachable Roller Track Configuration has the following advantages over drawer designs of the background art:

- **Reduced Cost:** The roller components 5 (typically plastic rollers, shoulder bolts, and sheet metal brackets) are considerably less expensive than heavy-duty full extension slides 3. This is because the conventional slides cantilever requiring higher strength and higher precision components. Additional cost savings are achieved if the track extensions 20 are shared with many trays (drawers) 4.
- **Longer Travel:** The Detachable Roller Track Configuration can allow the tray (drawer) 4 to slide out well beyond full extension with little additional cost. In the background art, the three (3) member slides could go only slightly beyond full extension. Additional travel would have required considerably more expensive slides with four (4) or more members.

#### **4. Hybrid Slide/Roller Configuration (Fourth Embodiment):**

[0052] The storage unit with the Hybrid Slide/Roller Configuration is depicted in FIG. 26 and uses supplementary rollers 5 with a drawer 2 that uses conventional slides 3. These supplementary rollers are mounted beneath the drawer 2 to support the load in the closed position. This additional support may be particularly useful in increasing the load bearing capacity of the drawer 2 in earthquake prone areas. These rollers 5 may also reduce the sag of the drawer, which may reduce the height required in the cabinet

1. Although, FIG. 26, depicts cabinet 1, as with the previous configurations, the storage unit with the Hybrid Slide/Roller Configuration may be a rack with a frame and open sides.

[0053] The storage unit with the Hybrid Slide/Roller Track Configuration has the following advantages over drawer designs of the background art:

- **Reduced Cost:** The use of the rollers 5 may allow use of less expensive, lower capacity slides 3. In these cases, the cost saved by the slides 3 may exceed the additional cost of the rollers 5.
- **Reduced Height:** The Hybrid Slide/Roller Configuration requires less height in some configurations. This occurs when the rollers 5 can be recessed into the cabinet 1 so the entire battery compartment opening 9 can be used by the tray 4 and batteries B. The drawer configuration of the background art with a similar load would either have a greater sag or would require additional reinforcement to avoid the sag.

[0054] Many variations of the embodiments described above and shown in the figures should be considered within the scope of this invention. For example, while the figures show four rows of rollers, other configurations with one or more rows are possible, depending on the width of the rollers and/or the weight bearing capacity required by the load on the tray. In the Roller Shelf and Cantilevered Roller Tray Configurations, the rollers may be mounted on a lower portion of the storage unit in various ways, for example, on projections or rods running parallel or orthogonal to the front opening of the storage unit. In the Detachable Roller Track Configuration, the

rollers may be mounted in tracks on sides of the storage unit, instead of being mounted on sides of the tray.

[0055] Further, the storage unit, whether configured as a cabinet, a rack, or other configuration, may or may not have an open top and bottom. Also, storage units may have multiple trays mounted above each other, side by side, or both.

[0056] The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.